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Art. XVII.—*On the Occurrence of the Pelecypod Genus Miltha in the Australian Tertiary.*

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(With Plate VIII.)

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Introduction.

One of the most striking fossils among the Tertiary mollusca from the Abattoirs Bore, near Adelaide, South Australia, consists of fragments of a large and exceedingly thick bivalve shell of Dosinid appearance, recently described by one of us under the name of *Dosinia grandis*. The present authors, after further examination of the type material and of some additional specimens from the same locality collected by Mr. F. A. Cudmore, are of the opinion that it is better placed in the Lucinoid genus *Miltha*, being referable to the subgenus *Milthoidea*, recently proposed by Marwick for two Tertiary species from New Zealand. Tate's record (1890, p. 174) of *Miltha* from a similar horizon in the Dry Creek Bore possibly refers to the present species, which is the only one of the genus as yet described from Australia.

The difficulty in recognition of its true affinities is due to the fragmentary nature of the material, and it may be noted that an incomplete shell from a boring on Flinders Island, Bass Straits, submitted to the senior author by Mr. P. B. Nye, and herein described as a subspecies, also bears a deceptive resemblance to a depressed *Dosinia* such as the North Australian *D. lamellata* Reeve or *D. plana* Reeve from China.

Our best thanks are due to Mr. Cudmore for the loan of his topotypes; to Mr. Nye, B.M.E., Government Geologist of Tasmania, for permission to describe the Flinders Island specimen; and to Miss J. Wilson-Smith for her excellent photographs of a difficult subject.

Family LUCINIDAE.

Genus **Miltha** H. and A. Adams, 1857.

Lucina (*Miltha*) H. and A. Adams, 1857, ii., p. 468 (Apr.). Lamy, 1920, p. 119. Grant and Gale, 1931, p. 291.

Phacoides (*Miltha*) H. and A. Adams. Dall, 1901, p. 806, and 1903, p. 1361.

Miltha, H. and A. Adams. Woodring, 1925, p. 115.

Type (by monotypy): *Lucina childreni* (Gray) = *Tellina childreni* (Gray), 1825. Recent, Brazil.

"Shell inequivalve, with the surface of the valves nearly smooth. Hinge with the lateral teeth obsolete." (H. and A. Adams.)

"Shell large, thick, ovate, compressed; umbos low, acute; lunule very small, deeply depressed; anterior and posterior dorsal areas poorly defined; sculpture consisting of exaggerated incrementals and obscure traces of radials; ligament and resilium external, wide, long; hinge of right valve consisting of a narrow anterior cardinal (3*a*) and a heavy obscurely bifid posterior cardinal (3*b*); hinge of left valve consisting of a heavy obscurely bifid anterior cardinal (2) and a narrow posterior cardinal (4*b*); anterior adductor scar very long." (Woodring.)

Subgenus **Milthoidea** Marwick, 1931.

Miltha (*Milthoidea*) Marwick, 1931, p. 70.

Type (by original designation): *Miltha neozelanica* Marshall and Murdoch, 1921. Pliocene, New Zealand. Figured by Marshall and Murdoch, 1921, pl. 16, figs. 1, 2, and pl. 17, fig. 1.

"Shell similar to *Miltha,* but having the posterior wing well developed and the long anterior muscular impression adjacent to the pallial line. The lunule, though small, is deeply excavated and tends to obliterate the right anterior cardinal. The attachment of the ligament is relatively broadly triangular, and differs markedly from that of Reeve's figure of *M. childreni* (Conch. Syst., 1841, pl. 59, fig. 2)." (Marwick.)

Miltha (Milthoidea) grandis (Hooper Woods, 1931).

(Pl. VIII., figs, 1-3.)

Dosinia grandis H. Woods, 1931, p. 148, pl. 7, figs. 5, 6.

Shell large, solid, subcircular, gently convex; umbo prosogyrate, acute; lunule small, deeply impressed; sculpture dominantly concentric, of closely but irregularly spaced fine raised threads, more prominent posteriorly, with intervening concentric striae, crossed by microscopic radial incised markings, visible only upon magnification, which are irregular and discontinuous, and commonly unite and bifurcate. This gives rise in the umbonal region to a fimbriate ornament, with the bifurcations usually directed umbonad; towards the ventral margin

the radial scratchings, which cross the concentric threads, form a sectinate ornament; in both cases this is to be seen only under a lens.

In addition to the fine ornament, obscure lineations from the umbo to the ventral margin form curved radii which are concave anteriorly. Approximately medially there is also a very shallow radial sulcus, about 4½ mm. wide near the ventral border, the finer concentric striae becoming somewhat irregular and oblique when crossing it. Traces of a posterior sulcus are present below the post-umbonal dorsal margin.

Hinge plate broad and heavy, anteriorly shallowly excavate, posteriorly bearing an elongate ligamental groove and an obliquely triangular roughened area for attachment of resilium. Right valve with a prominent narrow anterior cardinal, grooved on the posterior side, and a broad somewhat bevelled posterior cardinal, having a tendency to become bifid, separated by a deep pit for the reception of the left anterior cardinal; the latter is long, narrowly triangular, and weakly bifid, posterior to which is the deep pit for the right anterior cardinal, followed by the elongate left posterior cardinal. The anterior cardinal teeth tend to become effaced by a backward prolongation from the deeply inflexed lunule.

Adductor scars very large, deeply impressed; the anterior scar very long, ovate, and finely transversely striate; the posterior scar much smaller and longitudinally striate; inner ventral margin broad, weakly crenulate; pallial line entire.

About half the considerable thickness, 6 mm., of the shell is due to a secondary layer of chalky texture, which is distinctly punctate as in the Recent *Codakia punctata* (Linné).

Umbono-ventral diameter of largest fragment circa 61 mm.

Type Material.—Five syntypes, of which three are fragmentary left and two right valves, in the Tate Museum, Adelaide University Geology Department.

Type Locality.—Between 400 and 500 feet in the Abattoirs Bore, Dry Creek, near Adelaide, South Australia. Horizon uncertain but probably late Tertiary.*

Topotypes in the private collection of Mr. F. A. Cudmore comprise portions of two right valves and one left valve, which show a few additional features. In one the remarkable thickness of 11 mm. is attained, of which 8 mm. is due to secondary thickening, across which, in a second specimen, a deep groove runs obliquely from beneath the umbo past the anterior margin

* Since the paper was read, Mr. L. W. Stach has shown one of us (F. A. S.), an imperfect right valve, measuring 39 mm. in height, from the Kalimnan (Lower Pliocene) of Beaumaris, Port Phillip, Victoria. It is a *Milthoidea* closely allied to *M. grandis*, but definite identification with it is not made, since what remains of the post-umbonal margin is more curved, and internal thickening of the shell is wanting. It is less depressed than the Flinders Island shell.

of the posterior adductor scar. This groove is not always present, but there are traces of a second trending towards the tip of the anterior muscle scar, as is sometimes seen in *Codakia punctata*. Another fragmentary specimen shows the long anterior scar to be entirely within the pallial line, though closer to it than is usual in the Lucinidae.

The species is evidently a near relative of *M. neozelanica*, the type of the subgenus *Milthoidea*, but differs in the crenulation of the inner margin and in the crassness of the Australian shells, which are too fragmentary for closer comparison.

The associated molluscan species are numerous but somewhat puzzling; they appear to indicate an admixture of faunas extending from the Lower Aldingan (Janjukian) through Upper Aldingan (Kalimnan) to possibly still later, or ranging from Oligocene or Miocene to Pliocene or younger. It is probable that several horizons are represented by the material dumped beside the bore, but the state of preservation and nature of the matrix appear uniform throughout, so far as can be judged. The mollusca are being worked out by the junior author, who has already listed the pelecypods (Woods, 1931).

Miltha (Milthoidea) grandis flindersiana, subsp. nov.

(Pl. VIII., Fig. 4.)

This is founded on portion of a somewhat worn right valve which is probably conspecific with the South Australian specimens, with which it agrees in ornament and in hinge characters, though the teeth are less strongly developed.

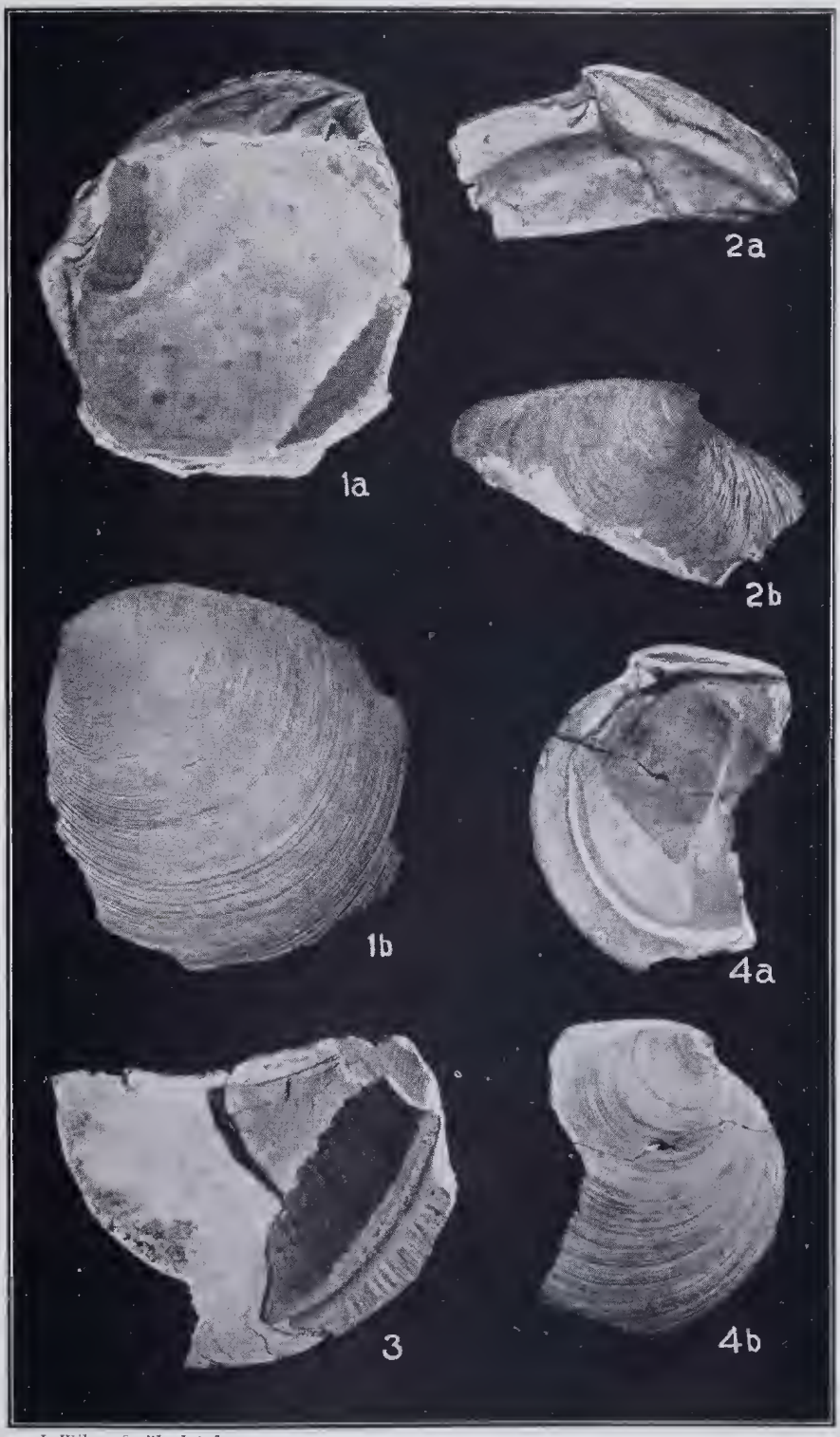
The median radial sulcus is practically obsolete, but the narrower posterior sulcus is prominent. The interior shows the elongate anterior adductor scar, but lacks the characteristic secondary thickening of the larger shells from the Abattoirs Bore, a difference perhaps due in part to age. It is also more depressed at all stages.

Length, circa 53 mm. (estimate); height, circa 50 mm.; thickness of valve 7 mm.; of shell, $2\frac{1}{2}$ mm. (max.).

Type Material.—Holotype in the collection of the Tasmanian Geological Survey, Mines Department, Hobart, Tasmania.

Type Locality.—Between 55 and 80 feet in No. 1 Bore, Wingaroo, Flinders Island, Tasmania. Horizon probably very late Tertiary or post-Tertiary.

The associated mollusca, which have not yet been studied, appear to be for the most part of still existing species, so that a late Cainozoic age is suggested. The conchological and geographic differences, as well as a probable difference in horizon, make separation as a sub-species the safest course, at least for the present.



J. Wilson-Smith photo.]

Miltha. Tertiary, Australia.

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Explanation of Plate VIII.

(All figures approximately natural size.)

Fig. 1.—*Miltha* (*Milthoidea*) *grandis* (H. Woods). Syntype, left valve. (*a*) interior, (*b*) exterior.

Fig. 2.—*M. grandis.* Syntype, right valve. (*a*) interior, (*b*) exterior.

Fig. 3.—*M. grandis.* Syntype, interior of left valve.

Fig. 4.—*M. grandis flindersiana*, n. subsp. Holotype, right valve. (*a*) interior, (*b*) exterior.